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Prevention and Mitigation of Overruns - Risk Assessment Tools (formerly RT/E/S/I4200)

This temporary front sheet facilitates change to the new Network Rail Standards referencing nomenclature.

The Ref above will be formally allocated to this standard when it is next changed in the meantime the contents, date and issue number of this Network Rail Standard are UNCHANGED and with immediate effect it should be referred to as “(new ref) formerly (old ref)”.

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Network Rail Company Specification

Prevention and Mitigation of Overruns - Risk Assessment Tools

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NETWORK RAIL COMPANY STANDARD

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Documents

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ISSUE RECORD

ISSUE	DATE	COMMENTS
Issue I	April 2003	New Document

IMPLEMENTATION

This Standard is to be implemented from 5th April 2003

COMPLIANCE

The provisions and use of the tools and techniques in Appendices D to F for Existing Layout assessments are mandatory from June 2003.

For infrastructure changes the provisions of the tools and techniques in Appendices A to F will be mandatory for projects where the scheme plan has not been signed as approved from June 2003 unless a derogation is approved by the Head of Signalling.

The specification is mandatory upon Network Rail and its Contractors

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1. Purpose

- 1.1 This document is a system specification and contains the tools and techniques to support the Company Standard RT/E/P/14201, Prevention, and Mitigation of Overrun - Risk Assessment of Signals. The tools and techniques provide a structured approach to signal overrun, (i.e. "Signal Passed at Danger" (SPAD)) risk assessment and should be used as part of the process shown in the standard.

2. Scope

- 2.1 This specification applies to anyone given the responsibility by Network Rail for conducting overrun risk assessments of railway signals forming part of track layouts and fixed block signalling systems on Network Rail Controlled Infrastructure. They may be either Network Rail employees or appointed contractors/consultants acting on behalf of Network Rail.

- 2.2 The tools and techniques will be used for the assessment of safety risk: -

- During the design of new/altered layouts and fixed block signalling systems on Network Rail Controlled Infrastructure.
- On the operational use of those existing layouts and signalling.

3. Tools and Techniques Summary

This specification ensures that a consistent set of tools, which are mutually compatible, are available for application in situations mandated in the process shown in company standard RT/E/P/14201.

The tools for undertaking signal overrun risk assessments have been developed through consultation and discussion, bearing in mind the following criteria: -

- Quantitative assessments should inform professional judgement.
- Professional judgement should be based upon all known and ascertainable relevant facts.
- Workshop time should be used as effectively as possible.
- The process should be seen to improve the understanding of SPAD risk and the selection of suitable controls for the situation under consideration.

The tools developed for the assessment of signal overrun risk and relevant controls on their use to support the processes in RT/E/P/14201, are described in the following Appendices: -

Appendix A	Preliminary Assessment
Appendix B	Junction Screening Tool
Appendix C	Preliminary Detailed Layout Design
Appendix D	Signal Assessment Tool
Appendix E	Layout Risk Method
Appendix F	Detailed Assessment

These Appendices contain full details of competencies, training and where appropriate the tools.

Table I below provides a comparison summary of the tools and techniques.

Table I Tools and Techniques Comparison Summary

	Preliminary Assessment PA	Junction Screening Tool JST	Signal Assessment Tool SAT	Layout Risk Method LRM	Detailed Assessment DA
Summary	Qualitative overview of risk - early design stage	Quantitative preliminary screening calculations	Quantitative relatively simple calculation – computerised	Quantitative detailed. Probabilistic Computerised calculations	Qualitative SEJ workshop Review quantitative data inputs. Consider HF issues. Iterative
Effort	Group of designers Operators	Single person. Simple mathematics	Trained Assessor – knowledge & skill required	Trained authorised users only. Significant data collection	Larger group of involved professional experts
Required Competencies required to undertake and be Involved in processes	Signalling design, Track design Railway operation, Train driving and local route knowledge. Understanding & appreciation of risk management principles and factors.	Experienced in operations or layout design. Understanding of Risk Assessment principles, Understanding of basic maths	Formal training course for users of the SAT.	Formal training course for users of the LRM	Formal training course for facilitators of the DA. Signalling design, Track design Railway operation, Train driving and local route knowledge. Understanding & appreciation of risk management principles and factors.
Benefits	Early identification of high risk locations & impractical options	Quick numerical comparisons as aid to decision making	Numerical comparisons as aid to decisions. Compatible with LRM philosophy. Can include HF issues	Existing established systematic process suited to complex layouts.	Consensus – centralised reviewing & decision making body. Credibility
Weakness	Not detailed.	Results are approximate only	Lower level of confidence than LRM. Rationalisation of some variables	Formal training required. Lengthy data collection	Time consuming. Proforma may restrict thoughts
Input	Preliminary design option layouts	Layout diagrams. Train speeds frequencies, conflict types	Layout diagrams. Train speeds, frequencies, conflict types, stock types, loading	As SAT but more detailed. Timetable method requires punctuality info	Initial SAT. All relevant diagrams, photos, videos etc
Output	Identification 7006 “simple RA criteria” signals. Geographical extent. High risk locations	Numeric risk score.	Unit-less “Collision, Consequence, & Risk Scores”. Comparative to support decisions	Predicted frequency of collisions and equivalent fatalities per annum	Review of initial SAT assumptions. Recommendation of most appropriate mitigation measures
Mitigation identification	Possible preliminary only	Yes –possible preliminary only e.g. flank protection.	No – model as recommended by DA	No – model as recommended by DA	Yes
ALARP indicated	No	No	No – only as aid to DA	No – only as aid to DA	Yes

4. Reference Documentation

GI/RT 7006	Prevention and Mitigation of Overruns - Risk Assessment
GI/GN 7606	Guidance Note: Prevention and Mitigation of Overruns - Risk Assessment
GO/RT 3252	Signals Passed at Danger
RT/E/P/14201	Prevention and Mitigation of Overruns – Risk Assessment of Signals Tools
SPAD Risk Ranking Model (SRRM) Railway Safety	
Layout Risk Method User Guide and associated Management procedure	
Railway Safety / Arthur D Little	

5. Definitions

Infrastructure Change	Any change to Network Rail Controlled Infrastructure that will result in a new or modified track layout and signalling.
Existing Layout	The operation of a track layout and signalling on a day to day basis.
Preliminary Assessment	A simple qualitative process to identify the risk issues, allowing them to be understood and a strategy developed and agreed for incorporating safety risk assessment into the project development process.
Junction Screening Tool	A very simple quantitative tool to allow comparison of risk from different layout options for infrastructure change.
Signal Assessment Tool	A quantitative method of providing an assessment of risk due to overrunning a specific signal protecting a junction.
Detailed Assessment	A qualitative technique using structured expert judgement (SEJ) in a facilitated workshop.
Layout Risk Method	A detailed quantitative software process for the assessment of risk at signals within railway layouts.

Level Crossing

In the context of this suite of documents RT/E/P/14201, RT/E/S/14200 & RT/E/G/14202 the term level crossing means a public road crossing such as AHB etc. It does not include accommodation or footpath crossings.

6. Abbreviations

ALARP	As Low as Reasonably Practicable
DA	Detailed Assessment
FOC	Freight Operating Company
HF	Human Factors
JST	Junction Screening Tool
LRM	Layout Risk Method
PA	Preliminary Assessment
SAT	A quantitative Signal Assessment Tool
SEJ	Structured Expert Judgement
SET Route	Train path route of an authorised train
SPAD	Signal Passed at Danger
SPAD Route	Route of a train having overrun a stop signal
TOC	Train Operating Company

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Appendix A Preliminary Assessment

A.1 Preliminary Assessment (PA)

A.1.1 Preliminary Assessment Description

The Preliminary Assessment (PA) is the first step that will be undertaken in the consideration of SPAD risk in an infrastructure change (see Fig 1 in Company Standard RT/E/P/14201). It is a simple qualitative process intended to bring together relevant experts to identify the risk issues, allowing them to be understood and a strategy developed and agreed for incorporating safety risk assessment into the project development process.

It will also identify when used in conjunction with the Junction Screening Tool (JST) the higher risk alternatives, and provide documentary evidence of the professional judgement process undertaken. It is not envisaged that the PA process will be a single meeting but is the approach to ensure that the steps outlined are carried out.

There is no existing formalised approach that fulfils the requirements of this category. Many, if not all, of the issues are presently addressed by the relevant experienced professionals in a more ad-hoc manner. The intention of the PA is to record the process from the early phase of design selection and development, to show that risk assessment principles are being included as part of the overall design procedure.

A.2 Process

A.2.1 It is neither appropriate nor necessary at this early stage of design development to methodically work through a predetermined pro-forma questionnaire of risk related elements as the process encompasses the identification of feasible layout designs and the preferred choice for detailed design. The PA process is therefore to consider the layout options and identify, through professional input of the competencies identified in section A.3 a layout that meets the requirements of GI/RT7006. The reference criteria indicated in Table A1 provide an aid to the process. The approach shall be holistic, to include a whole layout or subsections of a layout or scheme, rather than to methodically consider each individual signal in detail (which will occur at the later stages of risk assessment).

A.2.2 The PA comprises five distinct phases as shown in the following points: -

- a) An initial assessment should be made of whether information on signals and train protection fitment is available to identify whether signals will meet or will be likely to meet the “simple risk assessment” criteria as defined by section 4.4 in GI/RT7006, and hence which should require no further detailed consideration. Where the GI/RT 7006 categorisation 4.4b is

relevant (stop signal on a line fitted with a Train Protection System), care shall be taken to check that **all trains** will be fitted with the system during the time period under consideration. If there is likely to be a significant operating period (greater than 2 months) where some trains will not be protected by the system, then the layout will require further risk assessment.

NOTE: even though GI/RT7006 section 4.4b allows a simple risk assessment to be undertaken if TPWS is fitted to a layout, if TPWS is the only train protection system fitted on Network Rail Controlled Infrastructure, then the process described in RT/E/P/14201 Procedure shall be undertaken.

- b) If the layout does not meet the GI/RT7006 simple risk assessment criteria, the next step is to identify a safe track layout using the professional judgement of the competent persons involved in the PA process, taking into account all the components of the layout such as track, signalling and electrification equipment. The guidance provided in GI/GN7606 Appendices (in particular Appendices B and C for best practice in layout design) and the factors identified in Table A2 that affect the probability of a SPAD occurring at signals should be used to ensure that the layout is safely designed.
- c) If there is more than one potential layout, the Junction Screening tool should be used (JST) (see Appendix B of this specification for the JST process) to identify the comparative risks of the different layout designs. The results comprise one of the inputs into the final decision making process. The use of the JST will form part of an auditable record, justifying the choice of a particular single proposal.
- d) Once a single option or multiple options have been decided upon during the PA process, the next stage of the risk assessment process (as shown in fig 1 of the company standard RT/E/P/14201) is to undertake the detailed design of the layout (see Appendix C of this specification). It is expected that during the detailed design phase the initial SAT will be undertaken (see Appendix D of this specification for details of the SAT tool).
- e) Before the decision that the layout or signals meet the simple criteria in GI/RT7006 section 4.4b is recorded and the detailed layout design is undertaken, a final review of the decision to ensure that the layout still meets the simple criteria should be carried out. If it does not, then the process in fig 1 in company standard RT/E/P/14201 should be undertaken. If it does meet the criteria this fact should be recorded and detailed layout design commenced. If it no longer meets the simple criteria set out in GI/RT7006 section 4.4b then the PA process as set out in points (a) to (d) above should be undertaken.

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A.3 Competence

Personnel with railway operations, infrastructure, and signalling design expertise and experience shall make the necessary judgements during the PA process. Persons undertaking and forming part of the PA process should have competence in: -

- Signalling design.
- Railway Track design.
- Railways operation.
- Train driving and local route knowledge.
- Commercial & Performance Issues.
- Understanding and appreciation of risk management principles and factors producing risk in a railway context.

Typical attendees who collectively embody such competencies include: -

- Network Rail project manager,
- Signalling designer,
- Track designer
- Network Rail local operations management,
- Representatives from relevant train operating companies (TOCs/FOCs),
- Facilitator (if required).

The Reference List of Criteria for consideration is shown in Table A1. This shall be used as the guide to ensure that all relevant issues are addressed and recorded during the PA process.

Table A1 Reference list of Criteria for PRELIMINARY ASSESSMENT

GI/RT 7006 Ref	Criteria	Comment
	Identify the purpose and scope of planned changes to layout, signalling or operations	Ensure understanding of requirements of scheme and practicality of achieving them
4.4	Do the signals or layout meet the simple criteria in GI/RT7006 section 4.4?	If yes, record as simple risk assessment, no further detailed risk assessment required. If no, continue with PA process
	Existence and relevance of previous risk assessment	If yes, review previous risk assessment for suitability for input into PA process. If no, continue with PA process.
	Consider the geographical extent of the layout under review and the key risk changes associated with the proposed changes including infrastructure and human factors	Identify the likely import or export of risk from/to elsewhere and the risk drivers from the proposed changes, e.g. poor sighting, distractions, gradients, adhesion etc – record. Identify key/special layout features, signal arrangement or controls Ensure understanding and record
	Identify potential operational characteristics by ensuring understanding and appreciation of: - • Routes used • Train frequencies • Train types • Speeds • Passenger loading • Potential conflict type • Signalling controls	
	Preliminary identification of high risk locations and preliminary consideration of possible mitigation measures for incorporation into final design	Record – based on professional judgement (use of JST may assist identification)
	Is there more than one layout option available?	If yes, use the Junction Screening Tool to assess the comparative level of risks from each layout option. If no, continue with PA process and identify layout option to be submitted for detailed design
	Identify possible secondary consequences issues	Recognition and recording of specific details e.g. :- • Viaducts/bridges • Embankments • Tunnels • Electrical Supplies • Proximity of third parties / properties / fire risk / hazardous materials
4.4	Do the signals or layout still meet the simple criteria in GI/RT7006 section 4.4?	If yes, record the results. If no continue with PA process
	Layout identified to be put forward for detailed design.	